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## **Making it possible to search for life on Mars**

A new laser-based way of scanning rocks can find tiny quantities of biomolecules—signs that life may once have existed on a rock surface. New results show the technique can pick out these chemical signatures on a variety of minerals, including those that have been found on Mars, making the tool useful for searching for life on other planets.

Chemist Jill Scott at Idaho National Laboratory presented her research developing Laser Desorption-Mass Spectrometry, which can be used to detect life harbored in a single rock cranny, recently at the Joint International Symposia for Subsurface Microbiology and Environmental Biogeochemistry in Jackson, Wyo. With collaborators Daphne Stoner at the University of Idaho and Nancy Hinman at the University of Montana, Scott is working on a key component for a device that could someday be attached to rovers or other Mars-bound vehicles designed to be intelligent, life-finding robots.

The researchers studied jarosites, reddish or orange minerals common on Earth and discovered on Mars in 2004 by the rover Opportunity. When scanned using a tool known as a spectrometer, a barren rock sample generates a predictable chemical signature. But minerals that have once harbored life, even in tiny quantities, produce distinct spikes. Such changes might have arisen from an organism using some chemicals for energy, or depositing others on the rock as waste.

In the lab, existing techniques such as infrared spectroscopy were not sensitive enough to detect any abnormalities. Scott used ultraviolet light to analyze the remnants of bacteria grown on rocks, as well as natural jarosites. She found she can detect smaller quantities of biomolecules than with other methods. In addition, her "single-shot" approach doesn't average over different locations, so unlike other methods it can detect a single speck of evidence of life.

But independently confirming the miniscule amounts of biomolecules remains problematic, Scott says. "We haven't yet found any another technique that can confirm and quantify the biosignatures on these minerals."

Accompanying research by Beizhan Yan, of Idaho National Laboratory, and J. Michelle Kotler, of the University of Montana, explores how well the technique can detect biosignatures on different mineral types to help determine which rocks have the best chance for showing signs of life on Mars. This research is funded by a grant from the NASA Astrobiology Institute: Exobiology and Evolutionary Biology program.

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